Sketch of the mining industry in Japan

Japan.
Nōshōmushō.
Kōzankyoku

SKETCH

OF THE

MINING INDUSTRY IN JAPAN

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3	3	from the bottom	arc	Arc
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4	8	„ „ „	Outer	Inner
5	9	„ „ bottom	mesozoic	Mesozoic
25	5	„ „ top	operators, or other	operators or other,
26	19	„ „ „	Gold	gold
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32	8	„ „ „	on his own	on their own

SKETCH
OF THE
MINING INDUSTRY IN JAPAN.

I. INTRODUCTORY.

As a result of the development of our seaborne trade and also of our railroad traffic and industries in general, the demand for mineral products has increased apace, and the mining industry has become an important factor in the national economy.

Nothing accurate is known about the origin of our mining industry, but history records that, as early as in the 7th or 8th century, gold, silver, copper, iron, coal, and petroleum were produced. At the beginning of the 9th century, the Ikuno silver-gold mine, the Handa silver mine, the Hosokura silver-lead mine, and the two copper mines of Yoshioka and Osaruzawa were opened. During the 15th century and the time of the Tokugawa Shogunate, many important mines were opened, including the gold-silver mines of Sado, Innai, Kamioka, Mozumi, Serigano, Yamagano, and Kago; the Kosaka silver-copper mine; the copper mines of Ashio, Besshi, Ani, Arakawa, Hibira, and Omodani; the Ichinokawa antimony mine; the Kuratani silver-lead mine; the Taniyama tin mine; the Kamaishi iron mine, and the coal mines of Miike, Takashima, and Akaike. The working of these mines was, however, carried on a small scale, and they attracted but little attention. It was subsequent to the Restoration (1868) that phenomenal progress has been made in the mining industry.

The Government addressed itself to the task of protecting and encouraging the development of the mining industry; and engaged, in pursuance of that policy, foreigners as mining engineers, geological surveyors, and teachers. At the same time the Government undertook to work the principal mines, where Western methods were adopted in the departments of mining, metallurgy, and conveyance. The idea was to make these mines models for the benefit of private operators. Marked progress has since been made, and the output of minerals has steadily advanced. Such were the gold-silver mines of Sado and Ikuno, and the Innai silver mine. Seeing that the private working of mines was becoming pretty extensive, the Government gradually transferred the mines which it was working itself to private exploitation, reserving, however, those which were especially necessary to the State. Moreover, the law relating to mining was promulgated to define the rights of the mining operator, contributing thereby to the progress of that industry.

The putting into practice of the mining regulations in 1892 swept away all the existing evils that had interfered with a freer and sounder development of the industry, and extended a helping and protecting hand to the mining operator. This, together with the increase of technical knowledge, has led to remarkable progress in the mining industry.

II. GEOLOGY AND ORE DEPOSITS.

Geological Formations.—The geological formations of the Japanese Islands exist in the following proportions, taking the whole area of the land as 100:—

I. SEDIMENTARY ROCKS.

Archaean	3.78	
Palaeozoic	10.24	
Mesozoic	7.95	
Cainozoic	45.84	
		67.81

II. IGNEOUS ROCKS.

Older rocks	11.27	
Younger rocks	20.92	
		32.19
Total		100.00

The sedimentary formations, and contemporaneous igneous rocks, occurring in Japan may be tabulated in chronological order as follows:—

	Sedimentary Rocks.	Igneous Rocks.
Archaean.	Crystalline Schist System Gneiss System	Eclogite, Serpentine, Granite.
Palaeozoic.	Chichibu System (Carboniferous) Kobotoke System	Peridotite, Gabbro Diabase, Porphyrite.
Mesozoic.	Triassic Jurassic Cretaceous	Diorite, Diabase, Porphyrite, Porphyry, Peridotite, Gabbro, Granite.
Cainozoic.	Tertiary Quaternary	Liparite, Andesite, Basalt.

The geological feature of the Japanese Islands may be described to be in a form of two arcs along the whole length of the islands, beginning in the Kuriles in the north and ending in Formosa in the south. These arcs are curved towards the north-west, except in Formosa. Of the two arcs, the Outer arc or convex side facing the east is comparatively perfect in geological formation, the sedimentary rocks composing it being on the whole symmetrically developed.

On the other hand, the Inner arc or concave side facing the west is extremely complicated in formation and abounds in dislocations and eruptive rocks. The distribution of valuable minerals and the condition of mineral deposits are peculiar to each arc. Generally speaking, metalliferous veins are mostly met with in the region of the Inner Arc especially in eruptive rocks or strata intersected by such; while metalliferous beds are chiefly found in the sedimentary formations of the Outer Arc. In Formosa the Outer Arc faces the east and its formation is comparatively symmetrical. The formation at its northern part is exceedingly complicated owing to the presence of a big dislocation which geologically cuts it off from Okinawa. It is in this northern district that many mineral veins are found.

Metallic Veins.—Metal-bearing veins generally exist either in eruptive rocks or in the Tertiary formation. They are also found to some extent in Palaeozoic rocks.

The principal mines which are working such veins are as follows:—

Gold mines:—Hashidate in Echigo, Yamagano in Satsuma, Zuihō and Kinkwaseki in Formosa.

Gold-silver mines:—Sado in Sado, Ikuno in Tajima, Innai in Ugo, Ponshikaribetsu in Hokkaidō.

Copper mines:—Ashio in Shimozuke, Osaruzawa, Ani and Arakawa in Ugo, Okoya in Kaga, Obiye in Bitchū.

Lead mines:—Hosokura in Rikuzen, Kamioka in Hida.

Antimony mines:—Ichinokawa in Iyo.

Tin mines:—Taniyama in Satsuma.

Of the metal mines existing in Japan, copper mines are the most in number, the discovery of new copper veins being not unfrequent even at present. The copper ores of Japan very often contain more or less of gold or silver.

Impregnations.—Of the metalliferous deposits, those forming impregnations are especially found in the north of the Inner Arc. At the Kosaka mine in Rikuchū, which has recently become one of the most important copper-silver mines of Japan though it was a worked-out silver mine, ore deposits impregnating Tertiary tuff, locally known as "Kuromono" (black ores), are being mined.

Stratified Deposits.—Of the metalliferous beds cupriferous pyrites beds are markedly developed in the crystalline schist and the Chichibu systems, while beds of iron ore are especially rich in the Chichibu system. Beds of cupriferous pyrites are widely distributed, being found in the province of Tōtōmi, Kii, Awa, Iyo, Hyūga, and Higo. The Hibira and Makimine copper mines in Hyūga, and the Itsuki copper mine in Higo, are the principal copper deposits in the Chichibu system. Similarly the principal copper mines belonging to the crystalline schist system are Higashiyama in Awa, Besshi in Iyo, and Kune in Tōtōmi.

The beds of iron ore exist principally in the form of either magnetic or micaceous iron and are found somewhat transformed by the action of the granite, with which the beds are generally found. The principal iron mines are those of Kamaishi and Sen-nin in Rikuchū, Akadani in Echigo, Nakakozaka in Kōzuke, etc.

Manganese ore generally exists in the mesozoic system in the shape of irregular masses.

The principal non-metalliferous deposits in Japan are coal and petroleum. They are found chiefly in the Inner Arc where the Tertiary formation prevails, while stratified metalliferous beds are found in the Outer Arc. In Formosa, however, the coal-bearing beds are found in the Tertiary formation existing in the Outer Arc region.

Coal.—The coal existing in Japan is generally bituminous. The greater part of the seams occurs in the Tertiary formation and none of them in the Carboniferous formation. It may be conjectured that the strata belonging to this system were then formed beneath the ocean, and no vegetation existed to supply material for the formation of a coal-bed.

The coal-bearing strata belonging to the rocks of the Mesozoic era are the anthracite coal-fields found in the provinces of Nagato, Kii, and Higo, but they are comparatively insignificant.

It is in the younger Tertiary that the coal seams of Japan show a marked development. The principal coal-fields belonging to this class are those in Kyūshū and Hokkaidō, and also those in the Hitachi-Iwaki (Jō-ban) districts.

The coal-fields in Kyūshū comprise the extensive coal-beds of Chiku-hō (two provinces of Chikuzen and Buzen), Miike, and Hizen. Below will be described briefly the principal coal-fields in Japan.

A. The Ishikari Coal-field.

The Ishikari coal-field surpasses all others in Hokkaidō both in extent and in the quality of its coal. The field, which is situated to the east of the main course of the Ishikari River, extends to the length of 50 miles from the Sorachi River on the north, to the Yūbari River on the south, and is about 10 miles wide. The coal-bearing strata strike in general north to south, dipping east or west, gently in the south and steeply in the north. An anticlinal axis passes through the central part of the field, which includes the mining districts of Sorachi, Ikushunbetsu, Poronai, and Yūbari. In the travelling journal of Matsuura, who undertook an extensive exploration of Hokkaidō, and other northern regions, about 1855, the discovery of a coal outcrop on the banks of the river Sorachi is mentioned. About three years later, a man named Kimura discovered an outcrop of coal at Poronai while he was engaged in felling timber. In 1876, an American geologist, Mr. B. Smith Lyman, who did much useful work in connection with the coal and petroleum industries in Japan in the capacity of Government geologist, made surveys of Sorachi, Poronai, and the vicinity. In one of his reports he announced the presence of coal seams in the district of Yūbari. In 1879 the prospecting work was started at Poronai, but it was not till the fall of 1883 that extraction was regularly commenced. From that time till 1890 the Government worked the mine on its own account, but on the formation in that year of the Hokkaidō Tankō Tetsudō Kaisha (Hokkaidō Colliery and Railroad Company), the three mines of Sorachi, Ikushumbetsu, and Yūbari were sold to that company. Since then the company has been working them on an extended scale.

In these mines the seams contained in the Yūbari mine are the most extensive. The seams are three in number, one of which measures 25 feet, including parting of 6 inches to 3 feet. At the depth of 300 feet below this seam occurs another, measuring 4 feet in thickness. These seams extend 25,000 feet in length, dipping at angles of from 15 to 20 degrees. In the Sorachi mine thirteen seams are found, each measuring over 3 feet in thickness, dipping from 30 to 80 degrees. At present the tenth seam is being worked. The coal-bearing strata in the Poronai mine dip, in the north-western part, at angles of from 18 to 40 degrees and in the south-eastern part at angles of from 50 to 80 degrees. Over twenty seams of various thicknesses occur but of these only five are workable. The quality of the coal in all these mines is excellent, the product at Yūbari and Sorachi being specially suited for making gas or coke. The coal-field is worked almost exclusively by the Hokkaidō Tankō Tetsudō Kaisha, with only a single exception in the neighbourhood of this company's concession at Yūbari. In these mines there are compressed air plants, driving pumps, coal-cutters, ventilators, winding engines, and locomotives. Electric generators are also in use to drive ventilators, screens, various machines in the workshops, and also for illumination.

At present the Yūbari mine employs about 4,000 men, producing on an average about 1,500 tons in a day. Both in the Sorachi and the Poronai mines about 2,000 men are at work producing about 500 to 600 tons a day. The company's railroads connect the pits of all the mines with the exporting ports of Otaru and Muroran, while four steamers belonging to the company ship the coal to markets both at home and abroad.

B. THE CHIKU-HŌ COAL-FIELDS.

The Chiku-hō coal-fields produce more than half of the whole output in Japan, and possess, interlaid between sandstone, shale, and conglomerate, a large number of seams of which more than ten are workable. The coals from these seams are of a good bituminous quality and mostly make good coke. The penetration of volcanic rocks through the seams metamorphoses the coal to natural coke in some places.

Though the date of discovery is not exactly known, evidences go to prove that several beds in this rich coal region must have been exploited more than two centuries ago, while coming to the middle of the 19th century the coal was shipped to markets situated in adjoining districts. In those days the work was confined to surface seams, and it was not till 1881 when a steam engine was set up at the Sakano-o mine (now forming part of the Katsuno mine), that extraction in modern style was begun in this coal region. After that similar appliances were adopted at other mines as Namazuda, Shin-nyū, Meiji, Akaike, etc. About 1889 some of the portions reserved for use of the Navy at Tagawa, Kurate, and other places were opened for public exploitation, while about that time the Department of Agriculture and Commerce adopted legislative measures to discourage the separate existence of small concessions, and to encourage combination. Meanwhile the work of laying railroads through the important districts of Kyūshū advanced apace, and the facilities of transportation between the coal mines and the harbors of Moji and Wakamatsu were considerably increased. But what specially stimulated the development of the coal industry in Kyūshū was an extraordinary demand for coal after the Japan-China War. All those circumstances have combined to bring the work of the Chiku-hō coal-fields to the present state of prosperity.

The Chiku-hō coal-fields are in the five administrative districts of Tagawa, Kurate, Kaho, Onga, and Kasuya, all in Fukuoka prefecture, measuring over 30 miles from north to south and 8 to 16 miles from east to west.

The coal seams in the Chiku-hō coal-fields may be divided into upper and lower seams as to quality of coal. The coal obtained from the upper seams is inferior in quality, but possesses the advantage of being easily worked. The principal seams are five in number with a thickness generally varying from 3 to 6 feet.

C. THE MIIKE COAL-FIELD.

The discovery of the field dates more than four centuries ago. From 1873 to 1889 the colliery belonged to the Government, but it was subsequent to the latter year, when the Mitsui Company got the concession, that the work of the colliery began to present a marked activity.

The field measures 3½ miles from east to west, and 10 miles from north to south, facing the sea in the Miike district of Fukuoka prefecture and the Tamana district of Kumamoto prefecture. The area occupied measures 13,969 acres, while the output in 1902 amounted to 962,091 tons, the aggregate during the thirty years beginning 1873 being 11,737,931 tons.

Several seams occur, but at present the upper seam alone is almost exclusively worked. It measures 5 to 25 feet with an average thickness of 8 feet. The seam dips in general at an angle of 5½ degrees.

The coal is capable of producing 11,033 cub. ft. of gas and 1,389 lbs. of coke per ton of coal. It has also a high reputation as steam coal evaporating 8.64 lbs. of water at 212° F. per lb. of coal.

In the colliery there are six shaft plants, of which the largest is that called Manda. Its pit-mouth measures 12 feet by 41 feet and the pit reaches the depth of 826 feet. When all the arrangements have been completed, this pit alone is expected to yield more than 2,000 tons per day.

The pumping appliances at the colliery are on a large scale, the water issuing from the pits averaging 1,200 cubic feet per minute on ordinary days and 2,000 in the rainy season. Seventy-seven pumps are at work, requiring 15,254 horse-power. The pumping plant installed at Manda shaft, for instance, has a high-pressure steam cylinder 45 inches in diameter, a low-pressure steam cylinder 90 inches in diameter, a water cylinder 22 inches in diameter, and all of 12 feet stroke; and is able to deliver water against a head of 900 feet lifted in three stages of 300 feet each. It is described in the Encyclopædia Britannica as "probably the heaviest existing colliery pumping plant."

At present 2,000 men are employed underground, and 3,660 on the surface, the daily output being 3,050 tons. Excellent arrangements for transportation exist, 16 miles of railroad for the express purpose of conveying coal from the colliery to the nearest port being in operation, while at the port a wet dock, and loading appliances are provided. The dock can admit 80 barges of from 50 to 300 tons.

At present 4,000 tons can be loaded in 24 hours. All these facilities of transportation will become far more satisfactory when, with the completion of the improved working arrangements at Manda, a more capacious dock with improved loading appliances have been constructed. These additions are now in the course of construction.

D. THE TAKASHIMA COAL-FIELD.

The date of the discovery of this coal-field is not exactly known, though there is some evidence that the extraction was made about two hundred years ago. In 1817 the mine came into the possession of the feudal Lord of Saga and it was in 1867, that a shaft of European style was first sunk. Six years later the ownership passed to the Imperial Government, next year to the late Count Gotō, and in 1881 to the Mitsubishi Company, in whose hands it still remains. Considerable improvement both in the method and scope of working has been effected by that Company. At one time the daily output exceeded 1,200 tons, and though for a while afterward the output gradually declined, it somewhat revived its former activity when in 1898 new seams were discovered.

At Hajima, one of the three collieries collectively called the Takashima coal-field, a shaft was first sunk in 1887, and when in 1890 it came to the possession of the Mitsubishi Company the second and third shafts were sunk, and these only are now worked, as the work in the first shaft had to be abandoned as a result of a fire that occurred in it in 1897.

The seams at the Takashima mines generally run north-north-east to south-south-west, the dip being from 20 to 25 degrees at the north-eastern part and from 30 to 50 at the south-western part. There are sixteen seams, of which five are workable.

The strike of the seams at Hajima is on the whole similar to that at Takashima, only the dip is somewhat steeper, being as much as 60 or 70 degrees at the south-western part. There are thirteen seams, of which six are workable. The two mines work the same seams which measure on an aggregate over forty feet in thickness, holding, it is roughly estimated, 160 million tons. The quality of the coal is the best in Japan, it being especially suited for making coke and for steaming purposes.

The working galleries of the mines are in most cases situated under the sea-bed, some of them lying 1,630 feet below the surface of the sea. At present about 3,000 men are at work producing 16,100 tons a month on an average.

The coal-field is situated in the Nishi-Sonoki district in Nagasaki prefecture, and comprises the three small islands named Takashima, Hajima, and Yokoshima lying seven nautical miles from the harbor of Nagasaki. It covers 2,430 acres. In 1902 the output amounted to 189,135 tons. During the 22 years beginning 1881, when the concession came into the possession of the present leasee, the colliery produced 4,889,567 tons.

Petroleum.—It was in the 7th year of the reign of the Emperor Tenchi (668 A.D.) that the first authentic record about the oil fields of Echigo occurs. That record states that in that year "burning water" was brought from Echigo and presented to the Imperial Court. Though the working became somewhat active from the end of the 15th century to the middle of the 16th, still it was not till about 1875 that the business began to acquire commercial importance. The work was mostly carried on at that time in the districts of Kubiki and Niitsu. With the tapping of the bed at Amaze about ten years afterward, and especially after the work undertaken by the Japan Petroleum Company with regular boring machinery in 1890 had been crowned with success, something like a boom overtook the petroleum industry of Echigo.

The beds at Hire and Urase began to yield oil, while in 1898 the machine boring at Nagamine, and in the following year at Kamada struck rich beds of oil. From that time, boring has been successfully tried in several other places of Echigo.

Petroleum exists almost exclusively in the Tertiary formations found in the Inner Arc region. It is generally contained in the coarse sandstones interlaid between the layers of impervious shale. The oil-bearing area is very extensive, stretching over Hokkaidō, and the provinces of Echigo, Uzen, Ugo, Shinano, and Tōtōmi.

The principal center of production is Echigo which contains the five principal oil-fields of Higashiyama, Nishiyama, Amaze, Niitsu, and Kubiki, of which the first two are the most important. The Higashiyama oil-field consists of white sandstone, and the strata are generally found from 600 to 960 feet below ground. The Amaze oil-field consists of alternate layers of shale and sandstone, and some strata lie about 2,562 feet deep. Though the output has somewhat declined, the quality of the oil from this field is the best of all.

The Nishiyama oil-field, though on the whole similar in geological formation to that of Amaze, produces oil of inferior quality, and the beds generally lie about 600 feet deep.

At present the principal oil-fields in Nishiyama are Nagamine and Kamada. The first is worked by two companies and in 1902 produced 340,000 barrels, more than one-third of the total output in Japan. The crude oil is transported by pipe-lines to a refinery at Amaze over 9 miles from Nagamine, and also to a refinery at Kashiwazaki 11 miles away. The latter belongs to the Japan Petroleum Company and may be regarded as the model oil-refinery in Japan.

The oil-field at Kamada is exploited by the International Oil Company and other parties, and produced 120,000 barrels in 1902. The company possesses at Naoyetsu, a place 29 miles away, a refinery worked on a large scale.

Hire, Urase, Katsuhosawa, and Tsubakisawa are collectively called the Higashiyama Oil-field which in 1902 produced 265,000 barrels. A number of refineries for refining the Higashiyama oil are at work at Nagaoka, a place 6 miles from the field.

The oil-field at Niitsu was originally divided into a large number of concessions worked on a small scale, but they have subsequently been amalgamated for the most part, with excellent results as to yield. In 1902 this reached 186,000 barrels.

The Kubiki oil-field is the newest, oil having been struck in 1901. The next year the output reached over 28,000 barrels.

Graphite.—Graphite ores occur in Japan either in schistose rocks, in which case they exist in laminae or in masses in stratified rocks. Though very widely distributed, this mineral is still left comparatively neglected.

Sulphur.—Being a volcanic country, Japan is very rich in sulphur, which occurs very frequently in extensive deposits. The principal sulphur mines are Tsurugizan in Rikuchū, and Iwaonobori and Kobui in Hokkaidō.

Alluvial Deposits.—Alluvial deposits in Japan are represented by alluvial gold in the district of Esashi in Hokkaidō, and iron sand in Chūgoku. The former is detached from auriferous quartz veins in the Paleozoic rocks and deposited in the river-beds, while the latter originates from the decomposition of granite containing magnetite. Alluvial gold deposits are also found in the eastern districts of Formosa.

III. MINING AND METALLURGY.

General Remarks.—As the methods of mining and metallurgy were in a rudimentary stage before the Restoration and as experience or what would be called, in more familiar language, "the rule of thumb," was the sole guidance, it is no exaggeration to say that the mining as it is carried on to-day is a complete transformation from what it was forty years ago. Moreover, as all the processes of mining, dressing, and metallurgy were practically conducted by hand, the scope of business was necessarily limited and the output was therefore small, not to speak of the waste of minerals. In justice to our old miners, it ought to be added that with no accurate scientific knowledge and labor-saving appliances to assist their work, they developed, especially in the metallurgy of copper, lead, gold, and silver ores, many methods highly creditable to their ingenuity.

The Restoration inaugurated an important epoch in the annals of the mining industry in this country. In the year 1862, an American engineer named Pumpelly introduced for the first time in this country the use of an explosive which he applied at the Yūrap lead mine in Hokkaidō. In 1868, Kanso Nabeshima, then the feudal Lord of Saga, in conjunction with Mr. Glover, an Englishman, sunk a shaft of European style at Takashima. This was the first shaft ever sunk in Japan.

On the advent of the Meiji era, the Government undertook the mining business itself, taking the Sado, Ikuno, Innai, Ani, Kosaka, Kamaishi, and Ōkuzu metal mines as well as the Takashima and Miike collieries under its direct control, between 1868 and 1884. It engaged as many as 80 foreign experts for those mines, and improvements were zealously effected in various directions. In different branches of the mining industry, examples of foreign methods were set to private mining companies of adopting improved systems. At the same time, that is in 1871, an engineering school was established for diffusing a knowledge of mining and metallurgy. The result was a remarkable advance in technical knowledge among mining engineers.

A large number of private operators profited by the example thus set by the Government, and started mining enterprises in improved ways, and though their undertakings were not always successful, the result was on the whole a remarkable development of the industry. The mining industry now fairly launched, and there was little or no necessity for retaining the model mines; at least the Government seems to have taken this view of the matter, for it soon turned over the mines under its control to private enterprise.

Especially was the advance on coal-mining noteworthy about this time. In this Hokkaidō first set an example to the other parts of the country, the coal industry in that northern island dating from 1885. Then followed the exploitation of the coal-fields in the Chiku-hō districts, but it was not till Japanese coal first began to be sent abroad, in 1889, that any striking development took place. To give some idea of this progress, it may be stated that, whereas 28 years ago Japan had only one colliery employing a steam-engine and that her output of this fuel was only about 200,000 tons in a year, to-day engines amounting to nearly 36,700 horse-power are at work with the output reaching over 10,000,000 tons annually. As to the demand abroad of Japanese coal, it extends along the whole coast of China.

The petroleum industry is another mining business that has lately sprung into great importance. An object of curiosity known in olden times under the name of "burning-water," it was first turned in 1890 to real commercial use, and American boring machines were then introduced. The success of this innovation has given a powerful impetus to the development of the petroleum industry. To show briefly the advance by figures, the annual output of crude oil, which did not exceed 80,000 barrels eleven years ago with the pipe-lines extending less than 3 miles altogether, is now 1,100,000 barrels and there are 186 miles of pipe-lines.

Iron metallurgy was carried on in olden times in the province of Hōki, Izumo, and other places, the iron sand obtained by washing decomposed granite having been used for this purpose. The output of iron was necessarily limited. Eleven years ago the Government was impressed with the necessity of starting iron works in Western style, and a Commission was appointed to institute thorough inquiries into all matters pertaining to this new enterprise. The result of these inquiries was the establishment in 1896 of the Imperial Iron Works at Yawata, in Fukuoka prefecture. The works not being yet complete in all respects, the quantity of iron produced is still comparatively small though it will be considerably increased at no distant time. Private iron works at the Kamaishi mine produce more or less iron.

In the mining of precious metals, the output of silver reached a large amount at one time owing to the highly creditable progress made by our metallurgists in the process of extraction. It necessarily declined six or seven years ago, owing to the universal fall in the silver market. On the other hand, as a result of the discovery of alluvial gold deposits in Hokkaidō and the adoption of an improved method of extraction in the gold mines of Kagoshima, Ōsumi, and other provinces, the amount of the output has been carried to an almost unprecedented figure.

As to the mining of copper, which occupies such an important place in our mining industry, the output is advancing at a rapid rate, the ores being found almost everywhere throughout the country, while the processes of dressing and smelting are being greatly improved.

Referring to the following table the reader will see what rapid strides the Japanese mining industry has made during these thirty years, toward the development of the immense natural resources, most of which had remained neglected for over 2500 years. This activity, which may continue many years more, led the capitalists to feel the want of technical knowledge and strenuous efforts to impart the required knowledge began to be made both by the State and private persons. At present, in each of the Imperial Universities of Tōkyō and Kyōto, there is a course in mining and metallurgy. A course in metallurgy is also provided in the Ōsaka Higher Technical School, while in the Foremen Training School in Tōkyō, the two courses in mining and metallurgy are provided for the training of foremen in mines. Besides these, we have two courses in coal mining and mining machinery in the Mining School attached to the Akaike Colliery, Fukuoka prefecture, and a course in mining in the Fukuoka Technical School.

PRODUCTION OF PRINCIPAL MINERALS, 1874—1902.

Year.	Gold.		Silver		Copper.	
	Production in oz.	Rate of increase.	Production in oz.	Rate of increase.	Production in metric tons.	Rate of increase.
1874	3,129	100	87,782	100	2,110	100
1882	8,736	279	558,784	636	5,616	266
1892	22,523	719	1,936,753	2,206	20,727	982
1902	143,993	4,602	1,853,273	2,111	29,034	1,376

Year.	Iron.		Coal.		Petroleum.	
	Production in metric tons.	Rate of increase.	Production in metric tons.	Rate of increase.	Production in barrels.	Rate of increase.
1874	4,827	100	209,556	100	3,491	100
1882	12,164	252	936,447	447	23,259	666
1892	19,757	409	3,201,075	1,527	82,645	2,367
1902	78,893	1,634	9,799,040	4,629	995,280	28,509

N.B. In calculating the rate of increase in the above table the production in 1874 is taken as 100.

Output of Principal Mines.—The principal mines with their outputs in 1902 are given in the table below. Mines are not mentioned in this table whose output is less than 2,000 ounces of gold, 50,000 ounces of silver, 500 tons of copper, 500 tons of lead, 10,000 tons of iron, 100 tons of antimony, 1,000 tons of manganese, 1,000 tons of sulphur, 100,000 tons of coal, or 10,000 barrels of petroleum. (The output of any single product at the Ōmori, Hisaichi, Hiragane, and Hosokura mines, marked with an asterisk, does not reach the standard, but they are mentioned here because the output of all the minerals produced in each one reaches the standard as far as value is concerned.

PRINCIPAL MINES IN 1902.

I. MINES OF GOLD, SILVER, COPPER, AND LEAD.

Mine.	Prefecture.	Concessionaire.	Output.				No of Laborers.
			Gold (oz.)	Silver (oz.)	Copper (metric tons.)	Lead (metric tons.)	
Kinkaseki.	Formosa.	Tanaka Chōbei.	18,370	—	—	—	340
Sado.	Niigata.	Mitsubishi Co.	12,574	123,660	—	—	1,092
Ushio.	Kagoshima.	Ushio Gold Mining Co.	11,925	—	—	—	592
Yamagano.	„	Shimazu Tadashige.	9,404	—	—	—	253
Ikuno.	Hyōgo.	Mitsubishi Co.	6,814	167,167	447	—	937
Hashidate.	Niigata.	Takayama Katsuyuki and two others.	6,696	—	—	—	638

			Output.				
Mine.	Prefecture.	Concessionaire.	Gold (oz.)	Silver (oz.)	Copper (metric tons.)	Lead (metric tons.)	No. of Laborers.
Shintotsugawa.	Hokkaidō.		6,616 (alluvial)		—	—	—
Zuihō.	Formosa.	Fujita & Co.	6,025	—	—	—	710
Ōkuchi.	Kagoshima.	Iwatsuki Naohiko and four others.	4,628	—	—	—	255
Botankō.	Formosa.	Kimura & Co.	4,502	—	—	—	—
Usotannai.	Hokkaidō.		4,074 (alluvial)		—	—	—
Kuratani.	Ishikawa.	Kuratani Mining Co.	2,196	35,756	—	114	360
Peichan.	Hokkaidō.		2,196 (alluvial)		—	—	—
Innai.	Akita.	Furukawa Junkichi	2,199	261,737	—	—	1,104
Kamioka.	Gifu.	Mitsui Co.	—	132,194	—	804	732
Tsubaki.	Akita.	Araya Keikichi and five others.	—	111,612	—	—	316
Ponshikaribetsu.	Hokkaidō.	Hokkaidō Mining Co.	909	101,039	—	—	125
Handa.	Fukushima.	Godai Ryūsaku.	675	58,880	—	—	319
*Ōmori.	Shimane.	Fujita & Co.	864	30,830	—	—	403
Ashio.	Tochigi.	Furukawa Junkichi	—	—	6,762	—	6,974
Besshi.	Ehime.	Sumitomo Kichizaemon.	—	—	4,739	—	3,367
Kosaka.	Akita.	Fujita & Co.	1,031	96,087	3,050	—	3,479
Makimine.	Miyazaki.	Mitsubishi Co.	—	—	918	—	943
Hibira.	„	Naitō Seikyo.	—	—	876	—	1,520
Osaruzawa.	Akita.	Mitsubishi Co.	—	—	816	—	1,148
Ani.	„	Furukawa Junkichi	—	—	815	—	2,195
Arakawa.	„	Mitsubishi Co.	—	—	785	—	1,067
Obiye.	Okayama.	Sakamoto Kinya.	—	—	567	—	1,071
Yoshioka.	„	Mitsubishi Co.	—	51,175	529	—	1,270
Kusakura.	Niigata.	Furukawa Junkichi	—	—	515	—	627
*Hisaichi.	Akita.	Mitsubishi Co.	—	20,009	498	—	474
*Hiragane.	Gifu.	Yokoyama Ryūkō.	—	41,590	472	—	539
*Hosokura.	Miyagi.	Takata Shinzō.	—	28,394	—	318	293

II. Mines of Antimony, Iron, Manganese, and Sulphur.

Mine.	Prefecture.	Concessionaire.	Output (metric tons.)				No. of Laborers.
			Antimony.	Iron.	Manganese ore.	Sulphur.	
Kanō.	Yamaguchi.	Sunohara Kumajirō.	208	—	—	—	218
Ichinokawa.	Ehime.	Ichinokawa Mining Co.	154 51(crude)	—	—	—	319
Kamaishi.	Iwate.	Tanaka Chōbei.	—	20,060	—	—	991
Pirika.	Hokkaidō.	Murata Komakichi	—	—	1,953	—	79
Iwasaei.	Aomori.	Konishi Ihei.	—	—	1,503	—	78
Iwaonobori.	Hokkaidō.	Mitsui Co.	—	—	—	2,696	110
Kobui.	,,	Oshino Teijirō.	—	—	—	2,018	137
Tsurugizan.	Iwate.	Mitsui Co.	—	—	—	1,815	95
Kiritomehira.	Akita.	Asano Sōichirō & Tsubota Saheida	—	—	—	1,658	462
Shirikishinai.	Hokkaidō.	Yamagata Yūzaburō.	—	—	—	1,613	50
Rausu.	,,	Yanase Shōgo.	—	—	—	1,012	115

III. Coal Mines.

Mine.	Prefecture.	Concessionaire.	Output (metric tons.)	No. of Laborers.
Miike.	Fukuoka.	Mitsui Co.	962,091	6,652
Ōnoura.	,,	Kaijima Tasuke.	458,360	3,149
Yūbari.	Hokkaidō.	Hokkaidō Coal Mining & Railway Co.	425,943	4,025
Meiji.	Fukuoka.	Meiji Coal Mining Co.	420,695	3,428
Shinnyū.	,,	Mitsubishi Co.	353,821	4,001
Komatsu.	,,	Kurachi Iichirō.	301,952	1,118
Katsuno.	,,	Furukawa Junkichi.	301,050	755
Ōtsuji.	,,	Kaijima Tasuke.	240,721	1,310
Futase.	,,	Imperial Iron Works.	220,971	—
Tagawa.	,,	Mitsui Co.	210,157	1,667
Sorachi.	Hokkaidō.	Hokkaidō Coal Mining & Railway Co.	206,969	2,400
Namazuda.	Fukuoka.	Mitsubishi Co.	204,902	1,765

Mine.	Prefecture.	Concessionaire.	Output (metric tons.)	No. of Laborers.
Poronai.	Hokkaidō.	Hokkaidō Coal Mining & Railway Co.	194,886	1,709
Takashima.	Nagasaki.	Mitsubishi Co.	189,135	2,464
Akaike.	Fukuoka.	Yasukawa Keiichirō.	155,936	1,160
Akasakakuchi.	Saga.	Takatori Ikō and four others.	146,790	1,220
Gotoku.	Fukuoka.	Admiralty.	146,187	—
Iriyama.	Fukushima.	Iriyama Coal Mining Co.	144,636	680
Ida.	Fukuoka.	Mitsui Co.	143,138	948
Uchigō.	Fukushima.	Iwaki Coal Mining Co.	133,283	539
Yamano.	Fukuoka.	Mitsui Co.	130,806	386
Kanada.	„	Mōri Genshō.	130,687	874
Yoshinotani.	Saga.	Yoshinotani Coal Mining Co.	129,109	876
Hōkoku.	Fukuoka.	Hiraoka Kōtarō.	128,983	1,100
Onoda.	Fukushima.	Iwaki Coal Mining Co.	120,192	687
Kijima.	Saga.	Nii Keichō and three others.	117,938	842
Iwasaki.	Fukuoka.	Iwasaki Kumekichi.	105,648	308
Tadakuma.	„	Sumitomo Kichizaemon.	102,452	800

IV. OIL FIELDS.

Oil field.	Prefecture.	Output (Barrels).*
Nagamine.	Niigata	340,401
Niitsu.	„	186,439
Kamada.	„	120,782
Hire.	„	94,568
Uraze.	„	84,862
Katsubozawa.	„	68,123
Kubiki.	„	28,281
Tsubakizawa.	„	16,969

* The output is calculated as crude oil.

IV. CONDITION OF MINERS.

The Life of Miners.—The total number of persons employed in Japanese mines was 150,169 in June, 1902, including workmen underground and on the surface. Most of these laborers work underground, and in uncomfortable conditions, but in spite of these disadvantages, they are generally satisfied with their lot and go to work with light hearts. Some of those workers are natives of the district in which the mine is situated, but most of them are from other provinces, no small number of whom settle down, bring up families, and live there till their death. These laborers generally live in dwellings provided by their employers; those with families in separate rooms and those without families in large common rooms. The dwellings are either thatched or tile-roofed, and the inside of the rooms is comparatively clean, reflecting much credit on the miners. When the mines are in remote places, provisions are supplied by the mine operators, sometimes at a very low price. Evidently this institution of a cheap supply of food is adopted with a view to checking any movement for the rise of wages on the pretext of a rise in the price of commodities, for it is very difficult to lower wages when once they are raised.

As their calling is attended with some peril, their wages are on a higher scale than those of their confrères in other walks of life, as shown in the table given below.

In consideration of the great risk to which they are exposed, their employers are bound to take care of them, when they meet with accidents while on duty. The employers bear part, or the whole, of the expenses of medical attendance, and, when the patients are treated in hospitals other than those owned by the employers, they are daily paid a sum of money to meet their expenses in such hospitals. In case of their being disabled, they are given a fair amount of money, and in case of death, generally a sum of five *Yen* (one *Yen*=about 50 cents) or upwards is granted to the bereaved family toward the funeral expenses, besides some allowance to the family. The following table shows the sums paid, during the three years specified, by some of the mine-owners, under the circumstances mentioned.

FUNERAL EXPENSES.

	1899.		1900.		1901.	
	No. of Recipients.	Amount in *Yen.*	No. of Recipients.	Amount in *Yen.*	No. of Recipients.	Amount in *Yen.*
Miike	15	73.00	9	45.00	25	125.00
Besshi	2	24.00	10	80.00	5	41.94
Ikuno	45	251.00	39	197.50	42	166.50
Innai	2	9.00	3	15.00	2	10.00
Kamaishi	—	—	14	70.00	6	39.95
Ashio	7	58.00	16	119.00	15	127.00
Sado	5	24.00	1	5.00	1	5.00
Yūbari, Poronai, Ikushumbetsu, Sorachi, etc.	33	330.00	21	210.00	40	400.00

MONEY GIVEN IN AID OF THE BEREAVED FAMILIES.

	1899.		1900.		1901.	
	No. of Recipients.	Amount in *Yen.*	No. of Recipients.	Amount in *Yen.*	No. of Recipients.	Amount in *Yen.*
Miike	14	560.00	9	360.00	21	820.00
Besshi	—	—	—	—	2	40.00
Ikuno	138	796.10	164	957.80	185	1,096.80
Innai	2	29.00	3	67.20	2	54.83
Kamaishi	—	—	13	148.00	7	140.00
Ashio	6	100.00	15	355.00	16	330.00
Sado	4	150.00	1	30.00	—	—
Yūbari, Poronai, Ikushumbetsu, Sorachi, etc.	29	890.00	21	840.00	32	1,480.00

MONEY GIVEN IN RELIEF OF THE DISABLED.

	1899.		1900.		1901.	
	No. of Recipients.	Amount in *Yen.*	No. of Recipients.	Amount in *Yen.*	No. of Recipients.	Amount in *Yen.*
Miike	8	100.00	13	135.00	2	60.00
Besshi	—	—	—	—	—	—
Ikuno	42	871.50	49	1,043.00	50	1,143.00
Innai	—	—	—	—	1	14.44
Kamaishi	—	—	—	—	2	108.97
Ashio	3	60.00	2	50.00	3	53.00
Sado	—	—	—	—	—	—
Yūbari, Poronai, Ikushumbetsu, Sorachi, etc.	21	708.00	13	387.00	16	398.00

In large mines, miners' mutual aid associations are in existence. The aim of these associations is to extend help to the members in case of emergency. To this end reserve funds are created by contributions from the members, and also from the mine operators, or others and disbursements are made from these funds in case of the injury, illness, or death, of any of the members. The sums contributed by the miners vary in different associations. In some cases, a certain fixed sum is contributed uniformly by all, while in other cases, the sum contributed is in proportion to the position of the workman. Such contributions are made every month out of their wages. In granting the relief, the amount to be given is fixed, other things being equal, according to the length of time the party to be relieved has been a member of the association, or according to the position of the recipient, or according to both.

Although in petty mines where only a small number of workmen is employed no provision is made for the education of the miners' children, in larger mines they are educated either in schools established by the mine-owners or in public schools subsidized by the mine-owners. Under such circumstance, the rate of tuition fee is comparatively low.

V. MINING LEGISLATION.

In describing the legislative measures with regard to mining in Japan, the first thing that demands attention is the right of ownership.

Right of Ownership.—There are, generally speaking, three kinds of right of ownership of mines, these being: (1) the system of accession, that is to say, the system of ownership by the land-proprietor; (2) domanial system, that is to say, the system of State ownership; (3) the system of concession, that is to say, the system of giving concession by the State to the applicant.

Japan never adopted the first system; it adhered to the system of State ownership from olden times till quite recently; and when the privilege of working a mine was granted, this concession was regarded as a favor by the Government, given for a certain limited period in consideration of the payment of a royalty. This period, as mentioned in the Mining Regulations issued in 1873, was 15 years.

The advance of the country did not allow the continuation of such an arbitrary system, which was moreover calculated to seriously impair the development of the mining industry. In 1890 the Mining Regulations were amended, and with the operation of the new Regulations two years later the concession system distinctly establishing the right of permanent working was inaugurated, and thus the sound development of the mining industry was safeguarded.

Mining Work and Kinds of Minerals.—In the 1st article of the Regulations mining work is defined to mean prospecting, mining, and all other operations relating to mining.

Minerals recognized in the Regulations are as follows:—

Ores of Gold (excluding alluvial gold), silver, copper, lead, tin (excluding stream tin), antimony, quicksilver, zinc, iron, (excluding iron sand) iron pyrites, manganese, arsenic, graphite, coal, petroleum, sulphur, bismuth, chromite, phosphorus, lignite, and asphalt. The last five were added to the list in 1900.

Right of Prospecting and Mining.—Formerly an alien was disqualified from working a mine and was further prevented from becoming a member of a mining company, so that the right of working mines was reserved exclusively for Japanese subjects. In consequence of the amendment of the Mining Regulations in 1900 a company organized by Japanese or aliens, or by both combined is allowed to work mines, provided such a company is under Japanese laws. This amendment encouraging the formation of mining companies by aliens, has proved a means of stimulating the development of the industry.

Contrary to the usage in many Western countries, Japanese law does not recognize the right of priority of discovery. The right of prospecting or of mining is granted to the one who first applies for it whether he discovered the minerals or not. The reason for this is that the fact of an alleged discovery is exceedingly difficult to verify, and that accidental discovery does not deserve any special privilege. The right of prospecting carries with it the great privilege that no other person is allowed to apply for the privilege of prospecting for the same minerals in the same area (Art. XXI.).

The non-recognition of the right of priority of the owner of the land in which a discovery is made is derived from a fundamental principle of Japanese legislation, and must be regarded as a highly reasonable provision. The term for prospecting is limited to one year, to be extended to another year when such extension is regarded proper and necessary (Art. IX.). In contrast to this limitation in the period of prospecting no such limit is enforced in regard to mining. Further, though the right of prospecting can not be transferred to a third person, or be used as object of hypothecation, the right of mining can be sold, bought, assigned, or be made an object of hypothecation (Art. XX.)

The fact that the concession for working a mine was at first limited to the space of only 15 years, and that this concession was forbidden from being made use of as an object of hypothecation, seriously interfered with the proper development of the industry. The subsequent amendment of the Regulations has removed those two grave defects and to-day concessionaires and capitalists are enabled to invest large sums in the exploitation of mines.

Scope of a Mining Concession and Supervision of the Working.—The scope of a concession is fixed within a definite limit; it being not less than 10,000 *tsubo* (about 8 acres) for coal and not less than 3,000 *tsubo* (about 2.4 acres) for other kind of minerals (Art. XLI.), the maximum limit being 600,000 *tsubo* (about 490 acres) in both cases. The two extremes have been so determined in order to prevent the appearance of too many small concessions on the one hand, and to prevent the evil of monopoly on the other. However, in case of the combination of more than two concessions the maximum limit may exceed 600,000 *tsubo.*

In view of the fact that our mine-owners are too apt to attend to their own immediate interests at the expense of the permanent interest of the mining industry as a national economy, the Government has deemed it advisable to interfere more or less with the mining business. Thus a concessionaire is obliged to submit every year a programme of mining work and every six months a plan showing the existing condition of the mine to the Chief of the Mine Inspection Office and to obtain approval for the former before proceeding to work the concession (Arts. XXVI, XXVII.). Further, the concession may be revoked by the Minister of Agriculture and Commerce in case the working is suspended for more than a year (Art. XXIX.).

Use of Land.—As the mining operation involves the use of the surface of land, the interest of a concessionaire is often found incompatible with that of the owner of the land. The only way to find a way out of this difficulty is to requisition for the benefit of concessionaire so much land as is judged necessary for the conduct of his work and to give suitable compensation for his requisition to the owner of the land. It is to regulate these relations that a special chapter is devoted in the existing law to distinctly define the rights of concessionaires and land owners. According to the provisions therein contained, the owner of the land cannot refuse the concessionaire the use of the land required in the mining work, the land being specified thus:—

For the purpose of sinking shafts or driving levels.

For stowing ore, stone, and earth.

For constructing roads, railroads, tramways, canals, ditches or water reservoirs.

For constructing metallurgical plants and other buildings, electric lines, pipe lines or wire rope tramways required in mining.

The owner of the land cannot refuse to lease to the mine-owner the land required for the above mentioned purposes (Art. LXVII.), and the mine-owner in return must give to the owner a suitable compensation by way of rent, or payment for damages, or must deposit security against rent (Art. L.). Further, the mine-owner is obliged, on the request being made by the owner of the land, to purchase the land used by him in mining work for not less than three years. All the disputes between the land-owner and the mine-owner may be submitted to the decision of the Chief of the Mine Inspection Office, but when his decision is regarded as unsatisfactory by the parties concerned an appeal may be made, in case of a lease, to the Minister of Agriculture and Commerce, and to ordinary Courts of law in case of other kinds of dispute.

Mining Police.—From the nature of the work not only is the risk to life greater to those engaged in it than in ordinary work, but the work may also involve serious injuries to other parties, by causing, for instance, the depression of the surface of the land or by causing noxious or poisonous gases and liquids to spread in the neighborhood. It being judged inadvisable to leave the control of these matters to ordinary police who can not be properly qualified for the task, it is provided in Art. LVIII. of the existing Mining Regulations that the following matters shall be attended to by the respective Chiefs of the Mine Inspection Offices, subject to the supervision of the Minister of Agriculture and Commerce:—

Safety of architectural constructions connected with mining both inside and outside the mine.

Protection of the life and health of workmen.

Protection of the surface of land and of public interests.

When any cause of danger or of injury to the public interests in connection with mining is perceived by the Chief, he is authorized to order the concessionaire to remove such cause, under penalty of the suspension of the work in case of his disobeying the order (Art. LIX.), while the supervising authorities may themselves carry out the necessary preventive measures and cause the concessionaires to pay the expenses involved in the work.

The Minister of Agriculture and Commerce has further enacted Rules relating to Mining Police, and enforces strict control over such matters as the use of explosives, arrangements for ventilation, subterranean works, construction of chimneys, boilers, dressing and metallurgical plants, etc., provisions against accidents, etc. The Chief of the Mine Inspection Office sees to the faithful fulfilment of all the points specified in the Rules.

Protection of Mine Laborers.—In view of the great risk to life and health, special provisions besides those mentioned in the Police Rules are in force for extending protection to laborers and their families, these provisions being intended to enforce proper restriction as to the nature of the work, number of working-hours, and relief in case of death or injuries sustained in the discharge of duty. Every concessionaire is accordingly ordered to draw up, for use in his own particular concession, rules relating to workmen, and to submit the draft for the approval of the Chief of the Mine Inspection Office (Art. LXIV.); the object of this official interference being to provide against unreasonable demands either by the employers or the employees. Further, the Minister of Agriculture and Commerce is authorized by means of Departmental Ordinances to place restrictions on the working-hours of general workmen, and on the kind of work that may be imposed on female workers, and on the working-hours and kind of work of children (Art. LXXI.); also to cause the concessionaire to make suitable relief provisions both for workmen or their families when workmen meet with death, or are disabled, in the discharge of their duties. The concessionaire is under an obligation to draw up rules to deal with such cases, and to put them in practice with the approval of the Chief of the Mine Inspection Office.

Taxes on Mining.—Formerly the taxes were of two kinds, one on leases, and the other on the output. The former was at the rate of 1 *yen* (50 cents) for every 500 *tsubo* (about ½ acre) of metallic mines (except iron); 50 *sen* (25 cents) for every 500 *tsubo* of iron and non-metallic mines. The other tax was at the rate of 3 to 20 per cent. of the value of the output. In 1875 the tax on output was abolished to encourage the industry. But the imposition of a tax according to the extent of the concession was attended by a serious defect, for it induced the concessionaire to minimize the extent of the leases and therefore tended to prevent the proper exploitation of natural resources. By a further amendment, the original method of imposing two kinds of taxes was restored, but the rate for the lease was reduced to 30 *sen* per 1,000 *tsubo* and the tax on output, (iron excluded), 1 per cent. of the value of output (Art. LXXIII.). This restoration of the tax on leases, was made partly for the purpose of restricting the evil of forestallment by speculators, while the tax itself was in conformity with a long-established usage. The value of minerals is annually announced by the official quotation which is determined according to quotations in the principal markets (Art. LXXIV.). Those for which the official quotations exist are at present gold, silver, copper, lead, antimony, coal, and petroleum.

Alluvial Workings.—Alluvial gold, iron sand and stream tin are treated by the laws in a manner somewhat distinct from other kinds of ore; in this case the right of priority is accorded to the owner of the land. But when the owner does not work the deposits he cannot refuse permission being granted to those who desire to do so. The owner is entitled in that case to exact a suitable amount of royalty. However, the working can be undertaken only by Japanese subjects, and no alien, whether as a private individual or as a member of a company, is allowed to undertake the work. In most other respects the provisions of the Mining Regulations also apply to alluvial workings.

Mining administration affairs are subdivided into two categories, central and local. The former are taken charge of by the Director of the Mining Bureau subject to the control of the Minister of Agriculture and Commerce who has the power of granting concessions. Local affairs are managed by five Mine Inspection Offices throughout the country, each of which takes charge of a certain district.

The Chiefs of these offices deal in general, on his own responsibility, with matters relating to the grant of application for prospecting, approval of the working programme, enforcement of mining police regulations, and decision of disputes between land-owners and mine operators. When the act of the Minister, or the Chief of a Mine Inspection Office, does not give satisfaction to the person interested, he may lodge a complaint with the Minister, or the Court of Administrative Litigation.

VI. STATISTICS RELATING TO THE MINING INDUSTRY.

For convenience of reference, statistics relating to the mining industry are given here. Owing to unavoidable circumstances, these returns are not uniform as to the period they cover, though in most cases they begin in 1893 and end in 1902.

TABLE I.—NUMBER OF PERMISSIONS FOR PROSPECTING AND THEIR AREA.(a)

Year.	No. of Permissions.	Total Area (acres).	Rate of Increase in Area.	Average Area per Permission (acres).
1893	5,700	671,484	100	118
1894	6,095	910,819	136	149
1895	3,972	721,120	107	182
1896	3,411	722,774	115	227
1897	4,143	1,240,265	185	299
1898	3,959	1,349,860	201	341
1899	3,995	1,391,134	207	343
1900	5,184	1,785,593	266	341
1901	6,859	2,189,811	326	319
1902	6,467	2,026,902	302	313

TABLE II.—MINING CONCESSIONS AND AREAS.(a)

Year.	No. of Concessions.	Total Area (acres).	Rate of Increase in Area.	Average Area per Concession (acres).
1893	3,513	152,767	100	43
1894	3,725	194,568	127	52
1895	4,276	232,686	152	54
1896	4,882	305,471	200	63
1897	5,123	363,896	238	71
1898	5,270	405,106	265	77
1899	5,355	453,753	297	85
1900	5,389	481,845	315	89
1901	5,725	575,959	377	101
1902	5,908	643,919	421	109

N.B.—(a) In calculating the rate of increase, the area for 1893 is taken as 100.

TABLE III.—NUMBER OF ALLUVIAL WORKINGS.

Year.	Alluvial Gold.	Iron Sand.	Others.	Total.
1893	124	1,549	5	1,678
1894	111	1,566	5	1,682
1895	118	1,507	5	1,693
1896	201	1,478	4	1,683
1897	247	1,584	6	1,837
1898	294	1,646	8	1,948
1899	635	1,562	7	2,204
1900	2,199	1,507	8	3,714
1901	3,336	1,560	10	4,906
1902	3,604	1,508	34	5,146

TABLE IV.—OUTPUTS OF MINERAL PRODUCTS AND THEIR VALUE IN 1902.

		Output.		Value in *Yen* ($ 0.50)
1. MINERALS:—				
Gold		143,993	oz.	5,971,390
Silver		1,853,273	„	1,936,752
Copper		29,034	tons.	13,742,941
Lead		1,644	„	189,111
Tin...		19	„	18,610
Antimony	Refined ...	528	„	123,268
	Crude ...	88	„	11,220
Quicksilver		3,126	lbs.	3,072
Iron	Cast iron	44,393	tons.	1,468,290
	Wrought iron ...	847	„	81,550
	Steel	33,653	„	2,641,760
Iron pyrites		18,581	„	28,242
Manganese ore		10,866	„	67,010
Arsenic		26,873	lbs.	1,686
Graphite		97	tons.	19,842
Coal	Bituminous ...	9,511,899	„	31,882,639
	Anthracite ...	149,783	„	357,941
*Petroleum		995,280	barrels.	2,077,840
Sulphur		18,287	tons.	441,942
Total				61,065,106

* Calculated as crude oil.

Value of *Yen* ($ 0.50).

2. STONES AND EARTH :—

Building stones	2,485,578	
Limestone	1,083,099	
Clay	1,099,705	
Kaolin	210,478	
Miscellaneous	196,345	
Total		5,075,205
Grand Total		66,140,311 *Yen.*

TABLE V.—NUMBER OF LABORERS IN MINES AND ALLUVIAL WORKINGS AND NUMBER OF SHIFTS WORKED BY THEM IN A YEAR.

Number of Laborers.

Year.	Metal-Mines.	Coal-mines.	Other Mines.	Total in mines.	Alluvial workings.
1899	51,141	60,964	7,562	119,667	6,108
1900	54,805	70,508	5,698	131,011	9,835
1901	58,580	75,230	6,545	140,355	10,642
1902	60,339	78,947	7,653	146,939	8,440

Number of Shifts Worked by Laborers in a Year.

Year.	Metal-Mines.	Coal-Mines.	Other mines.	Total in mines.	Alluvial workings.
1899	15,102,605	16,539,887	1,141,946	32,784,438	1,002,722
1900	15,150,354	16,992,102	1,319,185	33,461,641	1,551,309
1901	16,102,664	19,414,676	1,414,331	36,931,671	1,354,450
1602	1,6549,638	19,971,308	1,450,989	37,971,935	1,494,401

TABLE VI.—DAILY WAGES. (In *Sen.*—1 *sen*=½ cent)

		Metal-Mines.					Coal-Mines.					Others.				
		1898.	1899.	1900.	1901.	1902.	1898.	1899.	1900.	1901.	1902.	1898.	1899.	1900.	1901.	1902.
Male.	Miners … … … …	43.5	48.8	48.1	51.7	54.0	63.2	59.4	66.3	67.3	64.8	39.2	37.9	43.7	52.6	54.8
	Timbermen … … …	38.4	40.4	42.0	43.0	44.9	61.5	61.3	62.2	62.6	66.9	37.4	41.7	33.7	40.3	44.0
	Mill Hands … … …	27.8	27.1	28.7	30.1	33.0	33.7	33.2	34.7	35.7	34.3	30.9	34.4	35.6	35.6	35.2
	Smelters … … …	34.1	35.8	35.9	37.3	40.0	—	—	—	—	—	40.3	69.3	46.0	46.1	49.3
	Carriers… … … …	31.9	33.7	39.5	49.5	42.6	44.0	42.1	44.3	45.5	48.3	37.3	37.9	46.9	51.4	56.1
	Miscellaneous … …	27.8	30.6	33.0	34.4	37.1	36.0	37.1	36.6	35.2	37.9	32.8	34.8	40.7	41.0	46.3
	Average… … … …	33.9	36.7	37.9	41.0	41.9	47.7	46.6	48.8	49.3	50.4	36.3	37.7	41.7	44.5	47.6
Female.	Mill Hands … … …	14.6	15.1	15.2	15.7	15.3	20.1	21.1	19.8	21.4	20.8	20.6	22.6	25.6	21.3	21.1
	Carriers… … … …	16.8	17.7	19.1	20.7	20.1	28.6	26.8	27.7	26.1	27.7	24.0	28.6	24.4	25.4	24.9
	Miscellaneous … …	18.6	17.7	18.6	17.8	19.5	22.7	22.6	24.5	23.2	26.4	18.4	21.4	18.2	19.5	19.8
	Average… … … …	16.0	16.8	17.9	18.1	18.3	23.8	23.5	24.0	23.6	25.0	21.3	24.2	22.7	22.1	21.9
Boys and Girls.	Mill Hands … … …	9.1	9.4	9.6	9.0	8.1	13.3	12.4	13.3	13.8	14.1	—	—	—	—	—
	Carriers… … … …	14.0	15.6	16.0	14.5	13.8	—	—	—	—	—	—	—	—	—	—
	Miscellaneous … …	12.0	12.0	13.0	12.7	14.6	17.7	18.0	18.6	20.2	21.2	—	—	—	—	—
	Average… … … …	11.7	12.3	12.9	12.1	12.2	15.5	15.2	16.0	17.0	17.7	—	—	—	—	—

TABLE VII.—NUMBER OF MOTORS USED.

		Water wheels.		Steam-engines.		Oil-engines.		Boilers.	
		No.	H.P.	No.	I.H.P.	No.	I.H.P.	No.	N.H.P.
1898	Metal mines	548	4,471	141	6,458	4	17	162	3,636
	Coal mines	1	18	620	36,714	—	—	440	13,343
	Other mines	3	132	103	2,141	—	—	33	315
	Total	552	4,621	864	45,313	4	17	635	17,294
1899	Metal mines	600	5,433	143	6,631	4	30	163	3,736
	Coal mines	1	18	704	43,164	—	—	499	14,921
	Other mines	3	132	148	3,150	—	—	46	357
	Total	604	5,583	995	52,945	4	30	708	19,014
1900	Metal mines	607	6,291	175	6,654	2	20	171	3,981
	Coal mines	1	18	848	48,761	—	—	566	16,793
	Other mines	3	132	223	4,526	—	—	82	864
	Total	611	6,441	1,246	59,941	2	20	818	21,638
1901	Metal mines	678	7,526	181	7,118	4	61	174	4,100
	Coal mines	—	—	999	52,823	—	—	638	19,115
	Other mines	5	182	343	7,042	—	—	174	2,399
	Total	683	7,708	1,523	66,983	4	61	986	25,614
*1902	Metal mines	775	8,669	184	7,267	8	84	180	4,195
	Coal mines	—	—	1,157	58,921	20	1,004	712	20,358
	Other mines	5	182	420	8,658	—	—	213	3,979
	Total	780	8,851	1,761	74,846	28	1,088	1,105	28,532

N.B.—The asterisk (*) represents returns at the end of June, the others being for December.

TABLE VIII.—TRANSPORTATION IN MINES.

1. Milage of Wire Rope Tramways.

Year.	Metal Mines.	Coal Mines.	Others.	Total Milage.
1898	26	3	14	43
1899	31	3	14	48
1900	35	4	16	55
1901	41	4	30	75
*1902	52	5	32	89

2. Milage of Oil Pipe-Lines.

Year.	Between Oil Wells and Tanks.	Between Tank and Refineries.	Refinery Premises.	Total Milage.
1898	7	20	11	38
1899	9	41	13	63
1900	13	92	15	120
1901	18	118	17	153
*1902	46	149	23	218

3. Railroad Milage.

	Metal Mines.			Coal Mines.			Others.			Total.		
	Under-ground.	On Surface.	Total.	Under-ground.	On Surface.	Total.	Under-ground.	On Surface.	Total.	Under-ground.	On Surface.	Total.
1898.	129	127	256	132	99	231	—	5	5	261	231	492
1899.	150	137	287	151	117	268	—	5	5	301	269	560
1900.	170	152	322	184	140	324	—	1	1	354	293	647
1901.	189	161	350	212	137	349	—	18	18	401	316	717
*1902.	213	174	387	342	226	568	1	19	20	556	419	975

N.B.—The asterisk (*) represents returns at the end of June, others being at the end of December.

TABLE IX.—NUMBER OF ACCIDENTS IN MINES.

1. Metal Mines.

	Underground.														
	By fall of Ground.		Accidents in winzes and Shafts.		By Ex-plosives.		Other Causes.		Total.		On Surface.		Grand Total.		Death rate per 1,000 laborers.
Year.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
1898.	—	—	1	2	—	—	—	—	1	2	—	—	1	2	.04
1899.	3	3	—	—	—	—	1	1	4	4	7	223	11	227	4.44
1900.	5	3	1	—	6	—	9	23	21	26	22	19	43	45	.82
1901.	36	13	3	1	18	3	12	7	69	24	26	4	95	28	.48
1902.	29	16	5	3	15	2	9	7	58	28	30	122	88	150	2.48

2. Coal Mines.

	Underground.																
	By fall of ground.		Accidents in slopes and Shafts.		By Explosives.		By Explosion of Gas or Coal Dust.		Other Causes.		Total.		On Surface.		Grand Total.		Death rate per 1,000 laborers.
Year.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
1898...	3	3	2	1	—	—	7	4	1	9	13	17	1	—	14	17	.22
1899...	12	8	7	10	1	—	16	217	5	11	41	246	4	—	45	246	4.04
1900...	45	20	18	4	3	—	40	4	9	4	115	32	10	2	125	34	.48
1901...	123	33	36	6	4	—	46	24	23	99	232	162	14	1	246	163	2.12
1902...	219	41	71	11	8	—	43	23	21	32	362	107	13	—	375	107	1.36

3. Other Mines.

	Underground.																
	By fall of ground.		Accidents in winzes and Shafts.		By Explosives.		Other Causes.		Total.		On Surface.		Grand Total.		Death rate per 1,000 laborers.
Year.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
1898	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1899	—	—	—	—	—	—	2	5	2	5	—	—	2	5	.66
1900	—	—	—	—	—	—	1	—	1	—	4	38	5	38	6.67
1901	—	—	—	—	—	—	2	1	2	1	1	—	3	1	.15
1902	1	—	1	1	—	—	—	—	2	1	7	12	9	13	1.70

TABLE X.—EXPORTS AND IMPORTS OF PRINCIPAL MINERAL PRODUCTS.

1. EXPORTS.

Year.	Copper.		Antimony.		Manganese ore.		Coal.		Sulphur.	
	Amount in metric tons.	Value in *Yen.*	Amount in metric tons.	Value in *Yen.*	Amount in metric tons.	Value in *Yen.*	Amount in metric tons.	Value in *Yen.*	Amount in metric tons.	Value in *Yen.*
1898 ...	16,454	7,627,075	1,338	216,598	9,985	156,333	1,819,807	12,240,622	12,627	477,014
1899 ...	21,304	11,383,358	1,046	206,516	9,395	152,688	2,029,805	11,784,713	16,684	574,868
1900 ...	20,478	12,725,935	377	107,708	12,903	224,897	2,422,007	13,703,655	17,966	698,284
1901 ...	21,991	13,904,610	279	78,491	8,953	187,177	2,945,593	17,542,273	17,928	661,879
1902 ...	20,654	10,261,984	1,160	271,612	2,694	52,540	2,962,251	17,270,417	21,273	759,083

2. IMPORTS.

Year.	Lead.		Tin.		Quicksilver.		Zinc.		Iron.		Petroleum.	
	Amount in metric tons.	Value in *Yen.*	Amount in metric tons.	Value in *Yen.*	Amount in Pounds.	Value in *Yen.*	Amount in metric tons.	Value in *Yen.*	Amount in metric tons.	Value in *Yen.*	Amount in Barrels.	Value in *Yen.*
1898 ...	3,489	416,384	360	227,258	196,689	176,303	2,996	637,434	288,273	14,055,709	1,608,464	7,498,658
1899 ...	3,805	523,899	366	361,287	203,888	219,013	3,885	1,167,533	146,276	12,106,128	1,244,928	7,895,332
1900 ...	7,017	1,101,510	399	473,104	222,429	258,698	6,095	1,568,813	249,839	23,945,206	1,610,204	13,593,393
1901 ...	6,976	994,803	471	530,243	189,765	218,612	3,526	837,541	184,875	14,279,727	1,642,771	14,943,401
1902 ...	4,740	572,468	437	501,008	206,943	254,197	4,666	1,173,358	180,715	13,607,297	1,797,147	14,937,169

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